WHAT IS CLAIMED IS:

1. A tunable etalon apparatus for receiving input light having input frequency channels therein and for providing output light therefrom, the output light having frequency channels corresponding to the input frequency channels with a relative time delay therebetween, the tunable etalon apparatus comprising:
a first variable partial reflector for reflecting and transmitting portions of the input light, the first variable partial reflector comprising:
a pair of partially reflective surfaces defining a gap therebetween, the gap comprising a material with a variable index of refraction; and
control means for adjusting the index of refraction of the material in the gap, thereby controlling the time delay of the input frequency channels;
and
a back reflector for reflecting the transmitted light back to the partial reflector, the back reflector and the first variable partial reflector forming a cavity therebetween; wherein light reflected by the back reflector is partially reflected by and transmitted through the partial reflector, thereby causing interference in the output light.

2. The apparatus of claim 1, wherein the gap between the pair of partially reflective surfaces being filled with electro-optic material.

3. The apparatus of claim 2, wherein the electro-optic material comprises liquid crystal.

4. The apparatus of claim 2, wherein the control means comprises means for applying voltage to the electro-optic material for varying the index of refraction of the electro-optic material.

5. The apparatus according to claim 1, further comprising one or more additional variable partial reflectors spaced apart from the first variable partial reflector forming one or more additional cavities, each variable partial reflector comprising:

a pair of partially reflective surfaces defining a gap therebetween, the gap comprising a material with a variable index of refraction; and

control means for adjusting the index of refraction of the material in the gap, thereby controlling the time delay of the input frequency channels.

6. The apparatus of claim 5, wherein the each of the cavities is an air-spaced cavity or a solid cavity.

7. The apparatus of claim 1, further comprising:

input means for launching the input light into the apparatus;

output means for transferring the output light from the apparatus;

collimating means for collimating the input light launched by the input means;

focusing means for focusing the output light onto the output means.

8. The apparatus of claim 7, wherein the input means and the output means comprise a dual fiber ferrule encasing an end of an input fiber and an output fiber; and wherein the collimating means and the focusing means comprise a single graded index (GRIN) lens optically coupled to the dual fiber ferrule.

9. A dispersion compensator comprising cascaded first and second tunable etalons according to claim 1.

10. The dispersion compensator according to claim 9, wherein the first and second tunable etalons have substantially equal and opposite dispersion curves forming an overall dispersion curve that has a flat top bandwidth for each frequency channel.

11. The dispersion compensator according to claim 10, further comprising third and fourth tunable etalons according to claim 1, cascaded with each other and with the first and second tunable etalons.

12. The dispersion compensator according to claim 11, wherein the third and fourth tunable etalons have substantially equal and opposite dispersion curves

forming an overall dispersion curve that has a flat top bandwidth for each frequency channel.

13. A tunable resonator apparatus for receiving input light having input frequency channels therein and for providing output light therefrom, the output light having frequency channels corresponding to the input frequency channels with a relative time delay therebetween, the tunable resonator apparatus comprising:

an input waveguide for launching the input light;

an output waveguide for transmitting the output light;

a ring resonator having an input and an output; and

a first variable coupler for coupling and distributing light from the input waveguide and the ring resonator output to the output waveguide and the ring resonator input, the first variable coupler including:

a material with a variable index of refraction; and

control means for adjusting the index of refraction of the material, thereby controlling the time delay of the input frequency channels;

wherein input light coupled into the ring resonator by the first variable coupler is transmitted back to the first variable coupler, thereby causing interference in the output light.

14. The apparatus of claim 13, wherein the material is an electro-optic material.

15. The apparatus of claim 14, wherein the electro-optic material comprises liquid crystal.

16. The apparatus of claim 14, wherein the control means comprises means for applying voltage to the electro-optic material for varying the index of refraction of the electro-optic material.

17. A dispersion compensator comprising cascaded first and second tunable resonators according to claim 13.

18. The dispersion compensator according to claim 17, wherein the first and second tunable resonators have substantially equal and opposite dispersion curves forming an overall dispersion curve that has a flat top bandwidth for each frequency channel.

19. The dispersion compensator according to claim 18, further comprising third and fourth tunable etalons according to claim 13.

20. The dispersion compensator according to claim 19, wherein the third and fourth tunable resonators have substantially equal and opposite dispersion curves forming an overall dispersion curve that has a flat top bandwidth for each frequency channel.